Traffic, Accidents, & Safety

A Historical Analysis of Collision Patterns in Southern California

Background:

Southern California Association of Government (SCAG) is the nation's largest metropolitan planning organization. In order to better understand problems that constituents may face, these maps depict the density of collisions throughout Southern California. The analysis done through the maps allows for a better understanding of collision patterns over a timespan of nine years (2003-2012). It uses data from the Statewide Integrated Traffic Records System (SWITRS), maintained by the California Highway Patrol. These maps can improve long term planning outcomes within the field of transportation, specifically within communities that are disproportionally impacted by environmental health related problems.

Objectives:
. Visualizing collision patterns from 2003 – 2012 in the SCAG region
. Understanding pattern changes for car, bicycle, pedestrian, and truck collisions
. Examining the relationship between high collisions and areas with disadvantaged communities

Methodology:

The Statewide Integrated Traffic Records System (SWITRS) is collected and maintained by the California Highway Patrol (CHP). SWITRS contains all collisions that were reported to CHP from local and governmental agencies. This data was downloaded from the Transportation Injury Mapping System (TIMS), maintained by UC Berkeley. The data was then queried by collision type: *All collisions, Pedestrian Collisions, Bicycle Collisions*. Within these three categorizations, the data was broken down by year (*2003, 2008, 2012*). Using the Spatial Analysis extension in ArcMap, the Kernel Density tool was used in order to observe the magnitude of collisions in the southern California region. The Kernel Density analysis allows for a visualization of point concentration. This is a better method than simple density because points that are closer together are weighted more heavily, resulting in a smoother distribution of values.

The disadvantaged communities layer is derived by the California Environmental Protection Agency, using the California Communities Environmental Health Screening Tool (CalEnviroScreen). This tool is intended to designate disadvantaged communities for the purpose of SB 535, which requires 25% of cap and trade revenues to be spent on projects that benefit disadvantaged communities (10% of which have to be located within a disadvantaged community). The layer is determined at a census tract level by indicators such as exposure, environmental effects, sensitive populations, and socioeconomic factors. The disadvantaged communities layer is overlayed onto the kernel density analysis output. By having both layers, spatial observations can be made and evaluated.

Conclusions:

From 2003 – 2012, the concentration of collisions has decreased in the SCAG region. Similarly, pedestrian and truck collisions have also decreased in the same time frame. However, when it comes to bicycle collisions, concentration of collisions has increased over time. Among all three categorization of collisions, the highest densities are located around the Downtown – Westlake - Koreatown neighborhoods of Los Angeles. At a regional scale, higher densities are found in the cities of Los Angeles and Santa Ana. Car, bicycle, and pedestrian collisions occurred more in core urban areas, whereas truck collisions typically occur on major freeways.

All high density clusters for pedestrian, bicycle, and total collisions fall exclusively within disadvantaged communities. These communities are disproportionately impacted by crashes that occur in their area. The proportion of total collisions and pedestrian collisions that occur within disadvantaged communities is decreasing. The proportion of truck collisions has a slight increase, while bicycle collisions fluctuate when looking at the years 2003, 2008, and 2012. In the year 2012, 49 percent of truck collisions occurred within disadvantaged communities. This is the highest proportion compared to pedestrian (46 percent), bicycle (43 percent), and total collisions (40 percent).

Spatial analysis, such as the use of the kernel density tool, allows for a visualization of collision clustering. By learning which areas have a high density of collisions, we can address the issue straightforwardly and allocating the necessary resources to ameliorate safety standards for drivers and pedestrians.

Future Improvements:
. Test for statistically significant hotspots of collisions within the SCAG region
. Test for statistical correlations between decreased collisions and improved transportation infrastructure
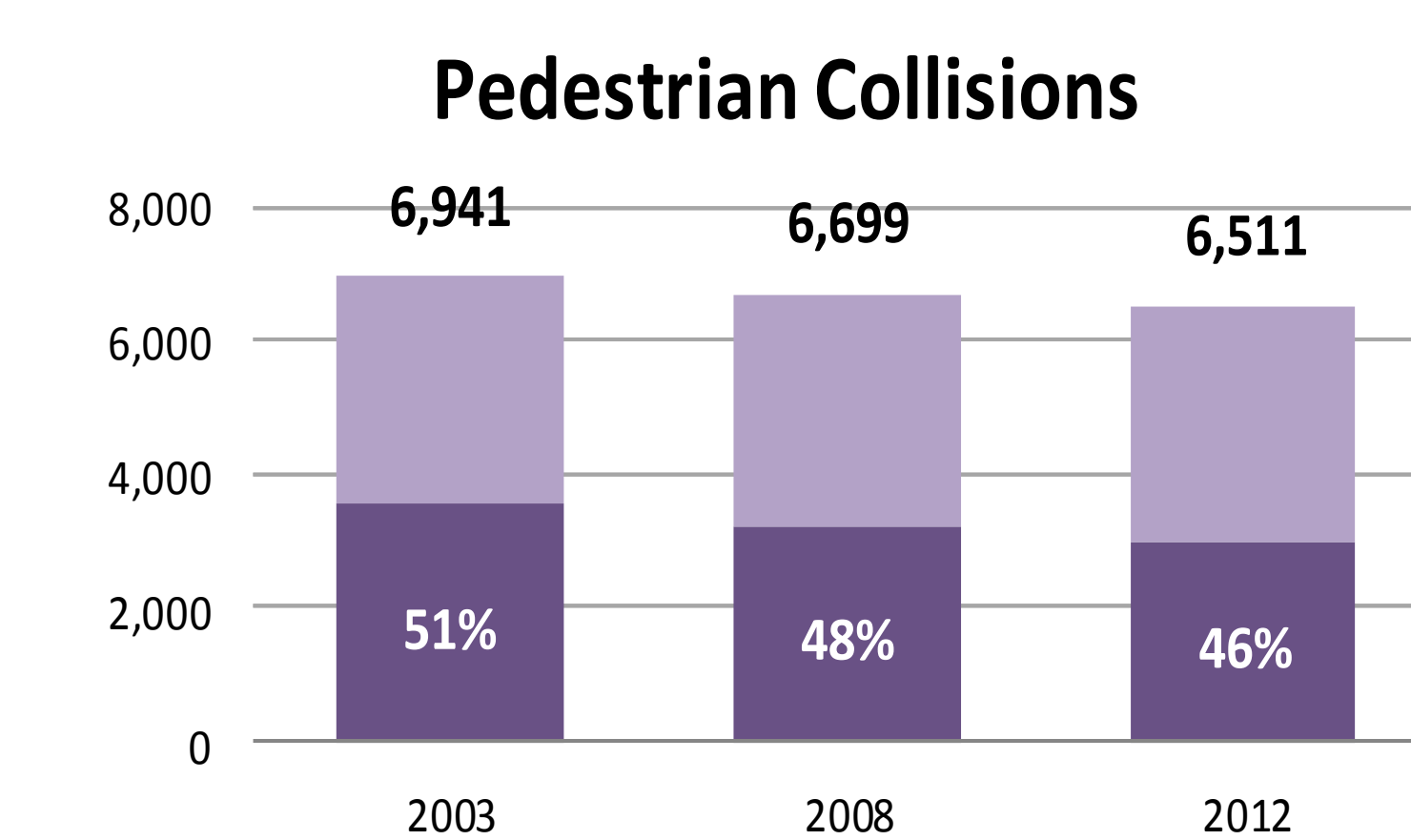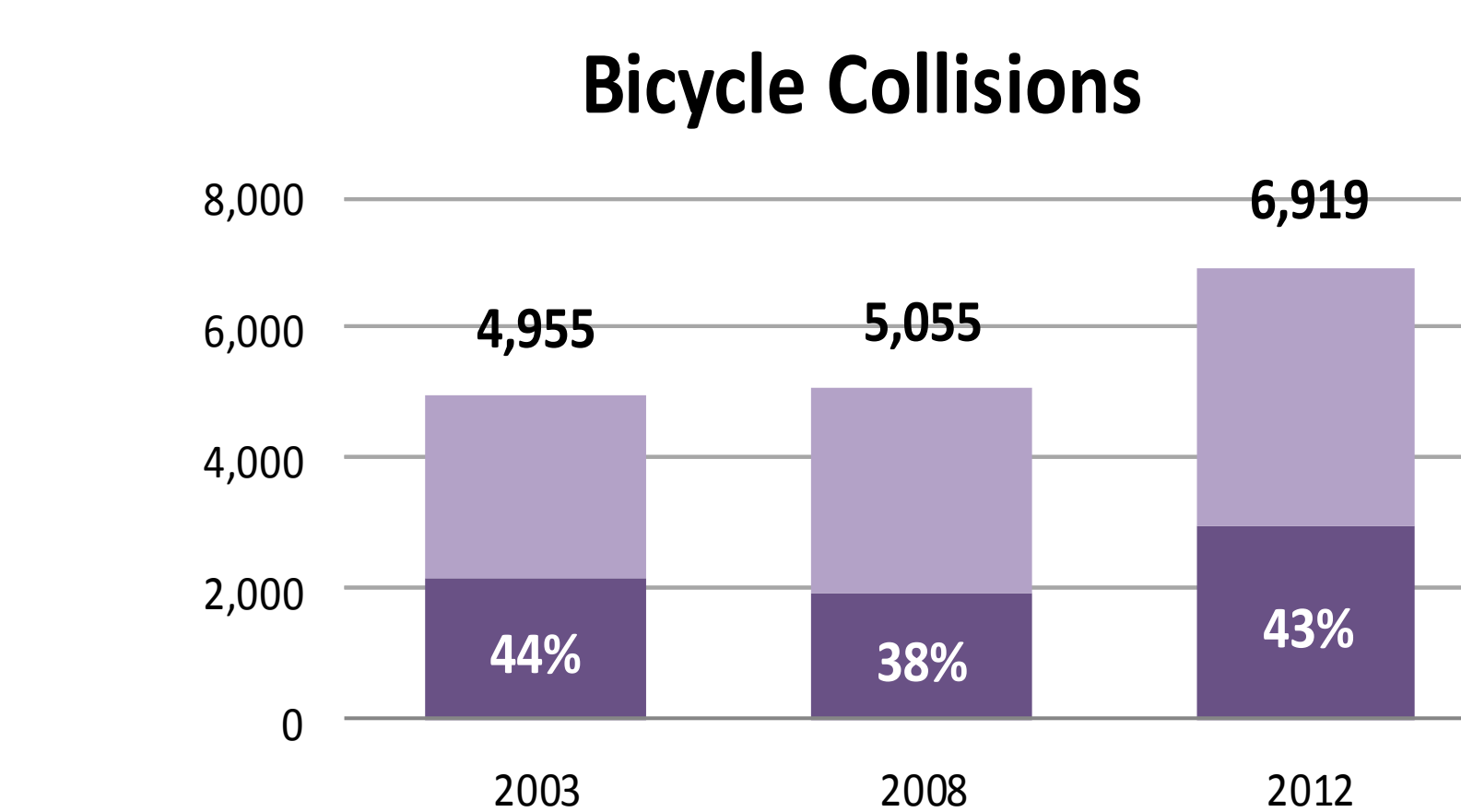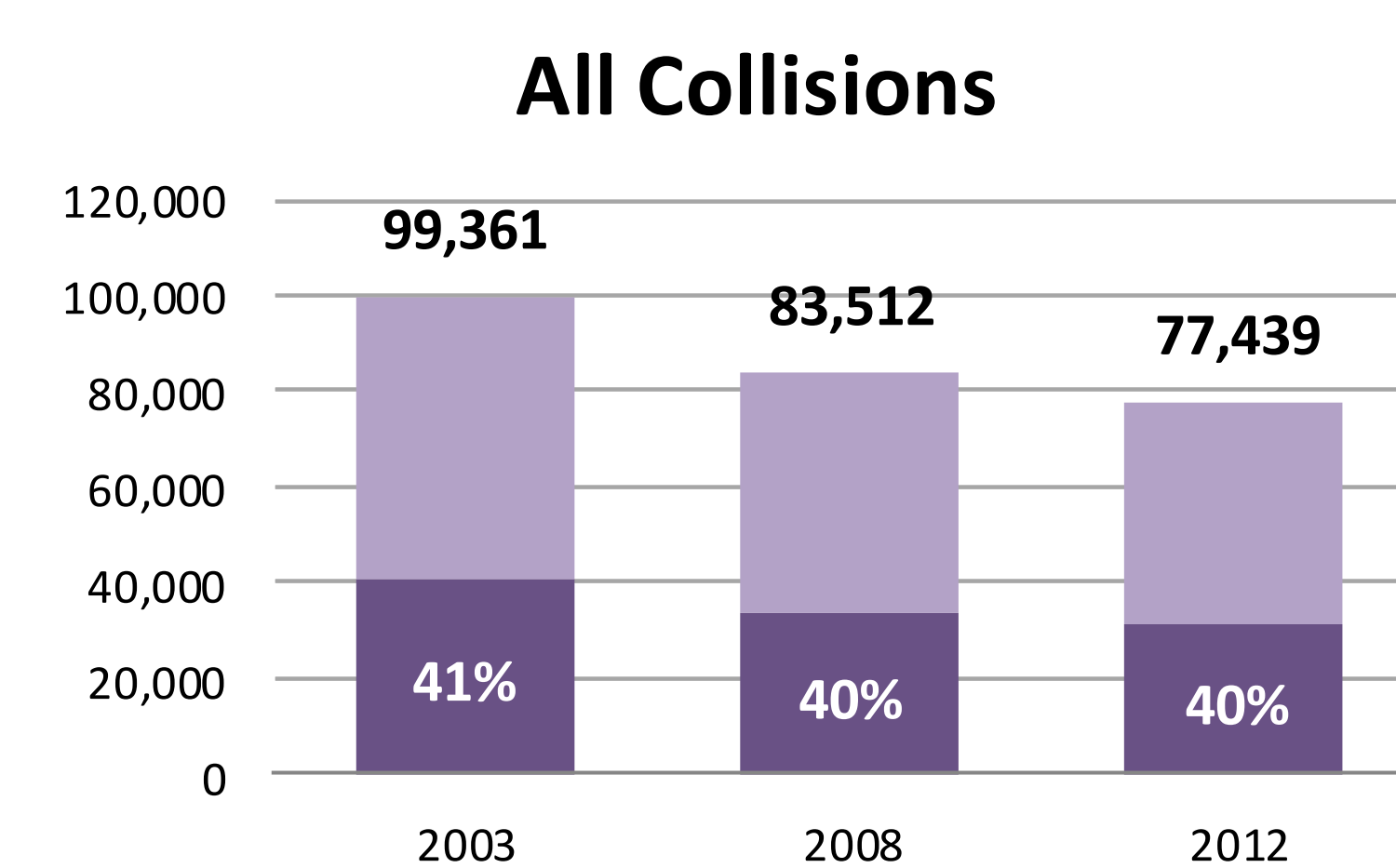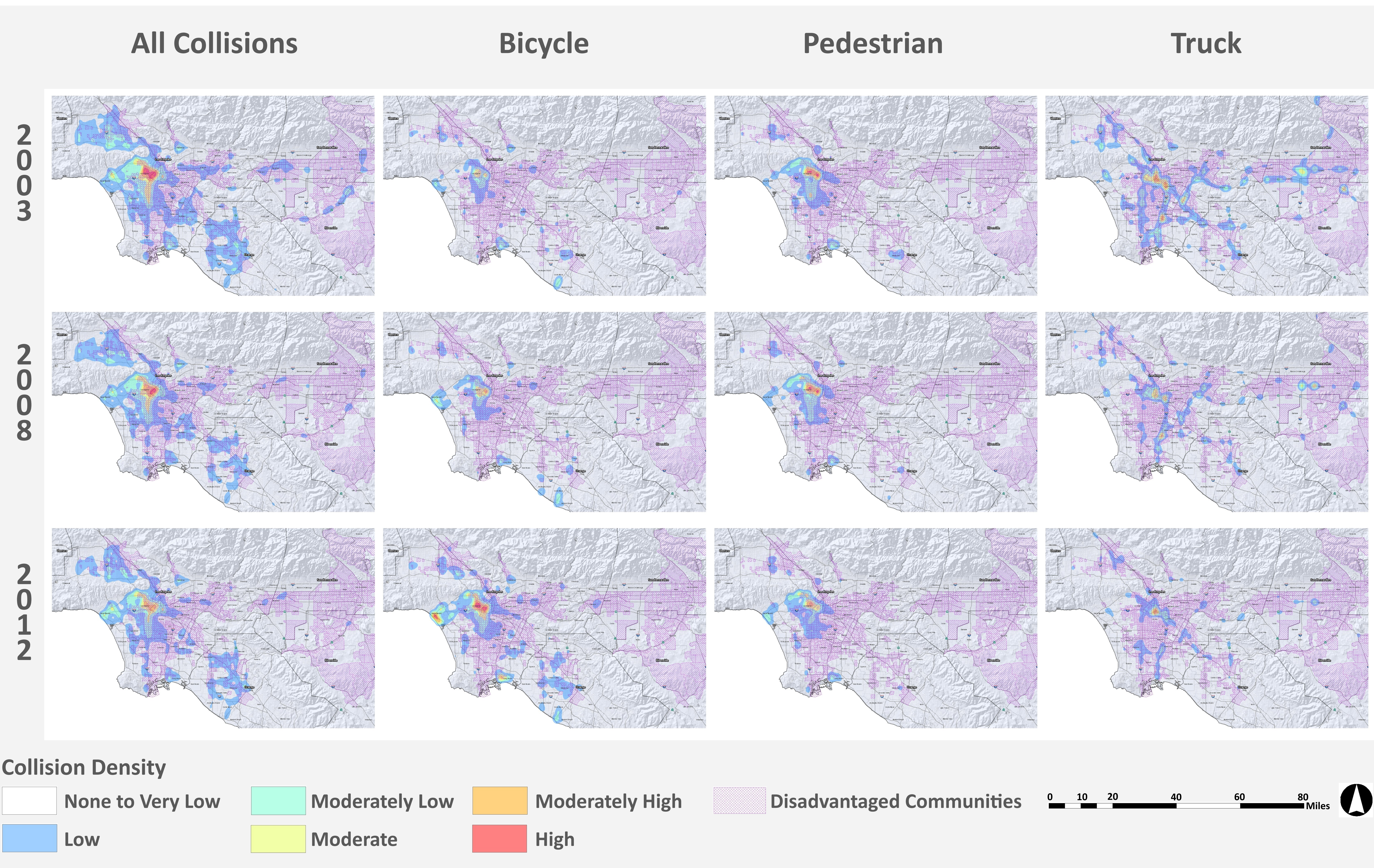
	All Collisions	Bicycle	Pedestrian	Truck
2003				
2008				
2012				

Collision Density

- **None to Very Low**
- **Low**
- **Moderately Low**
- **Moderate**
- **Moderately High**
- **High**
- **Disadvantaged Communities**

0 10 20 40 60 80 Miles

All Collisions

	2003	2008	2012
Total	99,361	83,512	77,439
Within Disadvantaged Community	41%	40%	40%

Bicycle Collisions

	2003	2008	2012
Total	4,955	5,055	6,919
Within Disadvantaged Community	44%	38%	43%

Pedestrian Collisions

	2003	2008	2012
Total	6,941	6,699	6,511
Within Disadvantaged Community	51%	48%	46%

Truck Collisions

	2003	2008	2012
Total	4,270	3,055	2,525
Within Disadvantaged Community	48%	48%	49%

■ Within Disadvantaged Community ■ SCAG Region